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PATENT APPLICATION

Encoding Apparatus, Video Camera

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AN ENCODING APPARATUS, VIDEO CAMERA

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to an encoding apparatus for encoding picture information and a video camera using the encoding apparatus.

Description of the Related Art

MPEG2_Video (ISO/IEC13818-2), for example, is known as a motion picture compression system that is directed to a high rate and high resolution. MPEG4_Video (ISO/IEC14496-2), for example, is also known as a motion picture compression system that is directed to a low rate and low resolution.

Here, JP-A-2000-312363 has proposed a technology for controlling a rate of MPEG4 by use of side information (such as total encoding amount) when MPEG2 is decoded to trans-code an MPEG2 stream into an MPEG4 stream.

On the other hand, JP-A-11-136683 has proposed a technology for utilizing a picture signal having low resolution to encode a frame of a video signal having high resolution.

In the trans-code disclosed in JP-A-2000-312363 described above, the output has one system, and picture information having high resolution/high rate

and picture information having low resolution/low rate cannot be outputted and recorded simultaneously.

The technology for encoding picture information having high resolution by utilizing more effectively the picture signal having low resolution that is disclosed in JP-A-11-136683 cannot improve picture quality of picture information having low resolution/low rate.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an encoding apparatus capable of outputting picture information in high picture quality, a video camera using the encoding apparatus and an encoding method.

The object described above can be accomplished by an encoding apparatus comprising a first encoder for encoding inputted picture information at a first rate or first resolution and a second encoder for encoding the inputted picture information at a second rate lower than the first rate or at second resolution lower than the first resolution, wherein, when the second encoder encodes picture information, it encodes the picture information by use of encoding information of picture information in the first encoder corresponding to the picture information, and the encoding apparatus outputs the picture information encoded by the first encoder and the second encoder, respectively.

BREIF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the invention will become more readily apparent from the following detailed description when taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a simplified block diagram of MPEG2/4 simultaneous recording;

Fig. 2 is a block diagram of MPEG2/4 simultaneous recording;

Fig. 3 is a timing chart of MPEG2/4 simultaneous recording;

Fig. 4 is a block diagram of a video camera; and

Fig. 5 is a block diagram of a digital signal inputting/outputting apparatus.

DETAILED DESCRIPTION OF THE INVENTION

An embodiment of the invention will be hereinafter explained with reference to the accompanying drawings.

Fig. 1 is a block diagram of an encoding apparatus according to an embodiment of the invention. When an inputted picture of the same timing is encoded by a first encoder 1 and a second encoder 2, respectively, the second encoder carries out encoding by use of information on a generation encoding amount of the first encoder, information on a quantizer scale and a

judgment result of Intra/Inter encoding.

Fig. 2 is a block diagram of the encoding apparatus according to the embodiment of the invention. To achieve MPEG2 recording, a picture input unit 20 converts an analog signal inputted from a camera 10 to a digital picture form, and stores it in a recording RAM 90. A motion compensator 30 reads outs a picture necessary for motion compensation in an encoder and compensates the motion. A judge block (Intra/Inter judge block) 80 executes changeover the judgment of Intra/Inter encoding. A discrete cosine transformer 40 executes discrete cosine transform. A quantizer 50 executes quantization. A rate controller 70 carries out rate control. A variable length encoder 60 encodes codes in MPEG2 and generates a stream of MPEG2. Decoded pictures locally decoded by the quantizer 50, discrete cosine transformer 40 and motion compensator 30 are stored in the recording RAM 90 and are used for motion compensation of a next frame.

In MPEG4 recording, a scaler (picture resolution converter) 100 scales motion picture data digitized by the picture input unit 20 to an object picture size of MPEG4 and stores the data in the recording RAM 90. The motion picture data is read out from this recording RAM 90, and an motion compensator 120, a judge block 110, a discrete cosine transforer 130, the a quantizer 140, a rate controller 150 and a variable length encoder 160 carry out motion picture

compression and generate a stream of MPEG4, in the same way as in MPEG2 encoder. Local decoding is carried out by the same way as in MPEG2 encoder and the decoded picture is stored in the recording RAM.

In this instance, the Intra/Inter changeover information of the judge block 80 of MPEG2 encoder, a quantized value used for rate control in the rate controller 70, information of the code amount generated, etc, can be looked up in the rate controller 150 of MPEG4 encoder. The Intra/Inter changeover information can be also looked up in the judge block 110 of MPEG4 encoder.

It is possible in MPEG4 encoder to optimize the quantizer scale and the frame rate on the basis of this MPEG2's information. Specifically, the generation code amount for each input picture of MPEG2 encoder, the mean value of the quantizer scales, the changeover condition of the Intra/Inter encoding of each macro block and a quantization value are monitored. Those pictures in which a drastic change of these values exist are assumed as a scene change, and a process that makes it easier to increase the quantizer scale in MPEG4 encoder, a process that makes it easier to select Intra encoding in encoding of each macro block, a process that executes intra encoding of the picture itself and a thin-out processing of the pictures for which encoding of the pictures is not made are executed. Inside the pictures, too, each quantizer

scale of MPEG2 encoder and the changeover condition of intra/inter encoding are monitored and easiness of encoding inside the pictures is ascertained. The quantizer scale and the changeover control of the intra/inter encoding are executed in response to the easiness so determined. Because encoding of MPEG4 encoder is executed by use of encoding information of MPEG2 encoder, the embodiment makes it possible to suppress deterioration of picture quality resulting from the drastic scene change and to improve quality of the MPEG4's pictures.

Incidentally, in an apparatus to which dual encoding according to the invention is provided, a first mode for executing the encoding in MPEG4 by use of encoding information of MPEG2 encoder and a second mode for executing the encoding in MPEG4 without using the encoding information of MPEG2 encoder may be provided. When the first and second modes are compared with each other, the first mode is superior in picture quality to the second mode. More specifically, when picture information in which a sudden scene change occurs is encoded in the second mode, the rate control comes to failure with the result that frame skips occur and the number of subsequent allotment bits becomes smaller. In contrast, when the picture information is encoded in the first mode, rate control does not fail and the frame skips do not occur. Therefore, picture quality can be said as being improved in comparison

with the second mode. On the other hand, because the second mode does not use MPEG2 encoder, it is superior in power consumption to the first mode. When a changeover switch capable of changing both of these modes is provided, therefore, priority can be selected between picture quality and power consumption in accordance with user's demand.

Next, Fig. 3 shows an encoding timing when MPEG2 and MPEG4 encodings are carried out.

The MPEG2 and MPEG4 encoders execute the encoding operation described above and encode the inputted pictures. However, MPEG4 encoder stores the inputted picture after scaling in the recording RAM and executes encoding with a time lag from picture encoding of MPEG2 encoder. Therefore, utilization of encoding information of MPEG2 encoder becomes easier.

Next, Fig. 4 shows a video camera using the picture encoding apparatus according to the invention. The camera 500 converts an analog picture to a digital picture and a picture encoder 520 executes picture encoding of MPEG2 and MPEG4 encoders. A microphone 510 inputs an analog speech and coverts it to a digital speech. A speech encoder 530 encodes the digital speech. A multiplexer 540 multiplexes speech data and picture data and stores multiplex data as a stream of MPEG's picture in a recording medium 550. A system controller 570 controls each constituent block. A picture display 560 executes conversion to a picture

display form (e.g. NTSC). A picture transmitter 580 executes control when the data recorded in MPEG4 encoder is transmitted to cellular telephone units, etc. Simultaneous encoding of MPEG2 and MPEG4 encoders is appropriately made depending on a user's selection. The MPEG2 stream is stored in the recording medium and the MPEG4 stream is reproduced by an output monitor and is transmitted to the cellular telephone units, etc. When the video camera of this embodiment is used for a monitor camera system, it is possible to record the data encoded by MPEG2 encoder to the recording medium and to transmit the data encoded by MPEG4 encoder to a communication terminal. When any change occurs in the picture taken (such as when the camera catches a burglar), the video camera can provide a high quality picture. When the change of the picture taken is great (when the change of encoding information such as the encoding amount generated is great), an alarm may be notified to the user on the communication terminal side through any means such as an alarm sound or rays of light.

Next, Fig. 5 shows a digital signal inputting/outputting apparatus using the picture encoding apparatus and a system construction using the inputting/outputting apparatus. The blocks that have already been explained are denoted by the same reference numerals, and the explanation of such blocks will be omitted. Here, the portion indicated by dotted

lines represents the digital signal inputting/outputting apparatus. The output block 610 transmits the picture information to the communication terminal 710, the recording medium 730 or the picture display 720. Incidentally, though the recording medium 730 and the picture display 720 are shown arranged outside, they may well be arranged inside the digital signal inputting/outputting apparatus. The apparatus to which the input unit 600 is connected is not limited to the camera 700.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and the range of equivalency of the claims are therefore intended to be embraced therein.